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ORIGINAL ARTICLE

Pain and discomfort perceived during the initial stage of active fixed orthodontic treatment

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Abstract *Background and objectives:* As the most common complication of orthodontic treatment, pain can negatively impact quality of life and cause patients to discontinue treatment. However, few studies have evaluated pain during orthodontic treatment, with controversial findings. This study assessed the intensity and duration of pain and discomfort caused by active orthodontic treatment.

Methods: This descriptive cross-sectional study examined 67 patients (22 men, 45 females; age range: 18–32 years) undergoing fixed orthodontic treatment. Patients were interviewed after the active treatment stage to assess their perceived pain and discomfort at different sites during different activities by a visual analogue scale. Frequency and duration of pain in different areas were analyzed by the chi-squared and chi-squared goodness-of-fit tests ($\alpha = 0.05$).

Results: Among the 67 patients, 65.7% experienced general dentogingival pain or discomfort and 34.3% had localized dentogingival pain or discomfort ($p = 0.010$, chi-squared goodness-of-fit test). Masticating soft foods reduced discomfort ($p = 0.000$, chi-squared) in the tongue, cheeks, and in or around the teeth and gingivae. Pain and discomfort were mostly moderate while masticating sticky, fibrous, and firm foods. Mild pains were mostly reported during tooth brushing and while consuming soft foods ($p < 0.05$, chi-squared). Pain and discomfort tended to last for more than 4 weeks, except in the tongue, where pain and discomfort lasted less than 4 weeks ($p < 0.05$, chi-squared goodness-of-fit test).

Conclusions: Pain and discomfort occur for more than 4 weeks after beginning fixed orthodontic treatment. Changing diets to incorporate softer foods is recommended to alleviate pain.

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1. Introduction

Orthodontic treatment has clear positive effects on a patient's physiological, functional, esthetic, psychological, and social health (Khosravanifard et al., 2012, 2013; Lara-Carrillo et al., 2010; Oshagh et al., 2011). However, it is also associated

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with complications, such as root resorption, caries formation, gingival/periodontal problems, allergic stomatitis, systemic metal accumulation, and iatrogenic damage during bracket debonding and bonding removal (Amini et al., 2012a,b; Khosravanifard et al., 2011; Lara-Carrillo et al., 2010; Rakhshan et al., 2012). The most common and problematic sequela of orthodontic treatment is pain and discomfort (Bergius et al., 2002; Erdinc and Dincer, 2004; Firestone et al., 1999; Krishnan, 2007; Miyawaki et al., 1999; Sandhu and Sandhu, 2013; Scheurer et al., 1996; Tecco et al., 2009). The intensity of orthodontic pain is comparable to the greatest intensity of general pain felt with a wasp sting or an ankle sprain (Bergius et al., 2002). Between 87% and 95% of adolescents experience pain during fixed orthodontic treatment, especially during the first 24 h. Moreover, 39–49% experience pain during every step of the treatment or after appliance removal (Bergius et al., 2000, 2002; Erdinc and Dincer, 2004; Firestone et al., 1999; Krishnan, 2007; Miyawaki et al., 1999; Scheurer et al., 1996; Tecco et al., 2009; Xiaoting et al., 2010). Therefore, pain is a major deterrent to orthodontic treatment, a factor that reduces patient compliance during treatment, and a reason that patients discontinue treatment or miss appointments (Bergius et al., 2000, 2002; Erdinc and Dincer, 2004; Krishnan, 2007; Krukemeyer et al., 2009; Miyawaki et al., 1999; Sandhu and Sandhu, 2013; Scott et al., 2008; Sergl et al., 1998; Xiaoting et al., 2010).

Despite its substantial clinical value, this area has been surprisingly neglected in the literature, educational programs, and practice (Bergius et al., 2000, 2002; Krishnan, 2007; Krukemeyer et al., 2009). Orthodontists usually underestimate the degree of pain caused by treatment and are not well-equipped to assess if and when their patients might need painkillers (Bergius et al., 2000; Krukemeyer et al., 2009). Pain has been assessed in only a handful of studies. All previous studies contained serious flaws. Some studies were of generally poor quality or lacking in research design while others were hampered by understandable experimental limitations. Many studies were negatively affected by small sample sizes ($n = 20$ in Fujita, 1979; $n = 17$ in Sinclair et al., 1986; $n = 70$ in Ngan et al., 1989; $n = 62$ in Scott et al., 2008; and $n = 55$ in Bergius et al., 2002), retrospective designs (Miyawaki et al., 1999; Sinclair et al., 1986), or study durations of only 1 week (Bergius et al., 2002; Erdinc and Dincer, 2004; Ngan et al., 1989; Sandhu and Sandhu, 2013). Furthermore, controversy exists over the rates (Bergius et al., 2000; Tecco et al., 2009; Xiaoting et al., 2010) and duration of orthodontic pain reported in studies of short duration (Bergius et al., 2002; Fujita, 1979; Jones and Chan, 1992; Ngan et al., 1989; Scott et al., 2008; Sergl et al., 1998; Tecco et al., 2009; Xiaoting et al., 2010) compared to the same parameters in studies that examine the entire treatment period or beyond (Lew, 1993; Miyawaki et al., 1999).

The two most important aspects of pain and discomfort in orthodontic treatment are its intensity and duration (Krishnan, 2007). Understanding these has clinical implications to improve patient satisfaction and the quality of oral health (Firestone et al., 1999; Krukemeyer et al., 2009; Tecco et al., 2009). In light of the importance of this mostly overlooked issue, we sought to determine the prevalence and duration of pain and discomfort associated with fixed orthodontic treatment at different sites and during teeth brushing or eating.

2. Methods

2.1. Patients

Filipino patients undergoing fixed-appliance orthodontic treatment from 2004 to 2008 ($n = 67$) were enrolled. The study population contained 25 original patients and 42 referral patients. There were 22 men and 45 women. Patients were between the ages of 18 and 32 years. Eighteen (26.9%) patients were 18–20 years old, 8 (11.9%) were 21–23 years old, 17 (25.4%) were 24–26 years old, 12 (17.9%) were 27–29 years old, and 12 (17.9%) were 30–32 years old. The study protocol was approved by the institutional review board of the Faculty of the Graduate School at the Manila Central University. Written consent forms were obtained from all participants. Provisions for emergency treatment were put in place if there were any adverse reactions, such as pain, allergies, or irritation of the oral mucosa or gums, during oral examinations. A contact number for the main researcher was provided in case any emergencies occurred.

The inclusion criteria required patients to be willing to participate in the study, generally healthy, nonsmokers, literate, have had less than two extraction sites before enrollment, and have healthy and normal gait and postures. The exclusion criteria were the presence of gingival or periodontal diseases before treatment in the 25 prospective patients, any removable orthodontic appliances, cleft lips or palates, patients wearing obturators or surgically corrected palatal shelves, any dental anomalies that would compromise the duration of leveling and alignment time (e.g., hyperdontia), contraindications for radiography (e.g., anemia), any signs/symptoms of temporomandibular disorders, heavy alcohol consumption, nonsteroidal antiinflammatory drug (NSAID) use, hospitalization, hormone therapy within 6 months before enrollment, pregnant or nursing mothers, or other hormonal conditions (e.g., goiter or hyperthyroidism).

2.2. Orthodontic treatment and pain

The initial phase of orthodontic treatment (leveling and alignment) was performed with fixed appliances alone, by using round frictionless nickel titanium archwires with the least possible force. The amount of force was not standardized between patients, as they had different conditions.

Immediately after the first treatment phase (3–6 months after the beginning of treatment), patients were interviewed with questionnaires about the pain and discomfort that they perceived during their treatment period. Pain and discomfort were defined as feelings of pressure, tension, soreness of the teeth, and/or any other oral pains or feelings of disturbance (Krishnan, 2007; Ngan et al., 1989). Pain and discomfort in the tongue, cheeks, teeth, and gingivae, while brushing the teeth, and while chewing various foods (sticky, tough, firm, soft, or fibrous) were recorded on a visual analogue scale (VAS) ranging from "no pain or discomfort" to "intolerable pain or discomfort". Intolerable pain was defined as a pain that would cause the patient (with any level of tolerance) to